Neutron-induced fission cross section of nuclei in the vicinity of ^{208}Pb at energies below 60 MeV.

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Neutron induced fission of nuclei in the vicinity of lead is the subject of both applied and fundamental studies. The data on lead and bismuth are of interest for the feasibility studies of accelerator driven system, because the lead-bismuth eutectic is presently considered as an appropriate material for the neutron production target. In terms of fission process study, this region of the chart element is of particular interest, because of possible manifestation of nuclear shell effects in the vicinity of the doubly magic nucleus ^{208}Pb.

In work [1] the measurements of the neutron-induced fission cross sections of ^{205}Tl, ^{204,206,207,208}Pb and ^{209}Bi have been carried out in the energy range up to 175 MeV. At incident neutron energies of several tens of MeV the cross sections are low enough to have a significant value. In the same time, the low-energy data are of special interest for fission theory, because an enhancement of quantum effects related with almost or completely filled (as for ^{208}Pb) neutron and proton shells is expected as the excitation energy decreases.

In order to improve the data obtained in work [1] as well as to extend the incident energy range towards the low energies, we have measured the neutron-induced fission cross sections of the six above mentioned nuclides at neutron energies of 32.8; 45.3 and 59.9 MeV. The measurements were performed at the neutron beam facility of the Universite catholique de Louvain at Louvain-la-Neuve, Belgium. Quasi-monoenergetic neutron beams were produced by the ^{7}Li(p,n) reaction. Fission fragments were detected with a multi-section Frisch-gridded ionization chamber (MFGIC) loaded with the sub-actinide targets under study and natural uranium target as a reference one. The fluence monitoring procedure was undertaken with the 59.9 MeV neutron beam and resulted in two measurements in agreement with each other derived from two different methods one using our MFGIC and our U target, the other using a fission chamber monitor previously calibrated with the proton recoil detection technique.

References:

1. G. Tutin et al., contribution to this conference.

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